

OBITUARY NOTICES OF FELLOWS DECEASED.

JAMES YATES was born April 30th, 1789, at his father's pleasant residence in the extra-parochial place of Toxteth Park, adjoining the borough of Liverpool. His father, John Yates, was the eloquent and highly respected minister of a Presbyterian congregation of ancient date, which included many of the most opulent and influential families of the town. His mother was a member of one of these families; she was the daughter of John Ashton, who had coal-mines near St. Helen's and salt-works on the Mersey, and wishing to obtain a cheap and easy mode of conveying his coal to the salt-works, projected the first canal in this country.

The subject of this notice was educated in classics under the Rev. Wm. Shepherd, minister of the Presbyterian chapel at Gateacre. In October 1805, James went to Glasgow University, in company with Henry Holland (the present Sir Henry Holland, Bart.), who introduced him as a student. He passed three sessions at Glasgow and one at Edinburgh, and took his M.A. degree in 1812. He had already studied biblical criticism and ecclesiastical history under the Rev. Charles Wellbeloved, tutor of a dissenting college at York. He now became minister of a newly formed congregation in Glasgow, and declared himself a supporter of Unitarian Christianity. This led to a controversy with the Rev. Ralph Wardlaw, the pastor of a large society of Independents. His 'Discourses on the chief points of the Socinian Controversy,' and Mr. Yates's 'Vindication of Unitarianism,' excited a good deal of attention. Mr. Yates at this time also took up the subject of "total abstinence," in consequence of the many excesses witnessed by him in Glasgow. He published some discourses on the question, which helped to lead the way to what has been called the "temperance movement;" but he had some doubt whether the taking of pledges of total abstinence is to be recommended. He thought a teetotaller better than a drunkard, but a temperate man better than either.

In 1817, Mr. Yates became minister of the new meeting-house which was built on the ruins of Dr. Priestley's chapel at Birmingham, and there remained until 1825. On the 24th of February, 1824, he married Dorothea, daughter of John William Crompton, a Brazil merchant, who survives him. Accompanied by her he, in January 1827, visited Munich, and afterwards Berlin, Mr. Yates being anxious to study under some of the most renowned German professors. He attended the lectures of Thiersch on Greek antiquities, of Ritter on geography, of Bopp on Sanscrit, and some others. He returned to England in April or May 1828, and took a house in Upper Bedford Place, in order to be near his half-brother, Dr. John Bostock, F.R.S., to whom he was tenderly attached. In 1831 Mr. Yates had the charge of a congregation in Little Carter Lane, Doctors'

Commons, from which, however, he retired in 1834, when his congregation presented him with a piece of plate.

From this time Mr. Yates devoted himself to scientific and literary pursuits. He became, as early as 1819, a Fellow of the Geological Society, and of the Linnean in 1822. He was one of the early founders of the British Association for the Advancement of Science; and at the termination of its first meeting at York in 1831, he was chosen Secretary to the Council, and continued to fill that office during some years. He became a Fellow of the Royal Society in 1839. He took an active part with Dr. Guest in the formation of the Philological Society in 1842.

In looking over a list of Mr. Yates's publications, it is impossible not to be impressed with the wide range of his subjects. He has several papers in the Transactions of the Geological Society for 1821, 1822, and 1825, and the Edinburgh New Philosophical Journal for 1831 and 1862; various papers on antiquities and language in the Journal of the Royal Asiatic Society for 1837, and in that of the Philological Society for 1842. He has various papers on theological and educational subjects in various journals; he contributed largely to Dr. Smith's 'Dictionary of Greek and Roman Antiquities,' 1842, and published separately, under the title of "*Textrium Antiquorum*," an account of the art of weaving among the ancients: part 1 was devoted to raw materials; a second volume which was intended to follow was not completed at the time of his death. He wrote in the 'Classical Museum,' in 1845, on *Acanthion* &c. of the ancient classics. He wrote on the natural order *Cycadaceæ* in the Proceedings of the Linnean Society in 1849, and contributed a number of papers to the Archæological Journal. He also exerted his influence to get introduced into this country an improved system of measures, weights, and coins; and in 1851 received the Telford Medal of the Institution of Civil Engineers, for an essay on the subject. He also contributed information on the metric system to the Statistical Section of the British Association. He has published a variety of papers in connexion with this subject, and was the principal supporter of the British branch of the International Association for obtaining a uniform decimal system of measures, weights, and coins.

As early as 1842 Mr. Yates showed symptoms of an overworked brain, and was ordered by Dr. Tweedie to seek refreshment in travel. Indeed every year he had, as it were, to evade the hay fever, to which he was an easy victim. In 1848 he acquired the lease of Lauderdale House, Highgate. Here he passed the remainder of his life, beloved and respected by all who knew him. Here, too, he gave to scientific men those pleasant garden parties and receptions which received additional interest from the historical associations of the place. He had just completed his 82nd year, when he sank quietly to rest, on May 7th, 1871, and was buried in Highgate Cemetery on the 11th, near the remains of his friend Henry Crabb Robinson.

Mr. Yates took great delight in his garden, and in the cultivation of botany. He was justly proud of his success in getting the *Cycas* to flower,

for which he gained the second prize at the International Horticultural Exhibition and Botanical Congress, held in London in 1866.—C. T.

GEORGE GROTE was born on the 17th of November, 1794, at Clayhill, near Beckenham, Kent. His father was George Grote, son of Andrew Grote, who, in the middle of last century, came to England from Bremen, settled as a merchant in the city of London, and on the 1st of January, 1766, in conjunction with George Prescott, established the banking-house that still bears their joint names. His mother was Selina Mary, only daughter of the Rev. Dr. Peckwell, of Chichester, who belonged to the connexion of the Countess of Huntingdon, and, owing to his eminence as a preacher, was selected by her as one of her chaplains. The wife of Dr. Peckwell was an Irish lady, Miss Blosset, of an ancient French Protestant family of Touraine, named De Blosset, some members of which came to this country at the revocation of the Edict of Nantes, and purchased property in the county of Meath.

George Grote the younger obtained the first rudiments of learning from his mother, who had an excellent understanding and good attainments, especially in history, being at the same time severely pious. In his sixth year he was sent to the Grammar School at Sevenoaks, kept by Mr. Whitehead. In his tenth year he entered Charterhouse, then under the charge of Dr. Raine, an excellent classical scholar; but nothing appears to have been taught there besides the learned languages. He had as companions at Charterhouse, Connop Thirlwall (Bishop of St. David's), the two brothers Waddington (one the late Dean of Durham, the other late Under-Secretary at the Home Office), Henry Havelock, and Cresswell Cresswell; with the first three he maintained a warm friendship through life. He left Charterhouse in his sixteenth year, a good classical scholar, having been uniformly at the top of his class. During his holidays he was provided with a teacher at home for French and Mathematics.

In 1809, on leaving school, he entered the banking-house as clerk, being made a partner when, in 1815, he reached the age of twenty-one. While devoting himself sedulously to business, he employed all his spare hours in reading and study. He followed out his classical scholarship to a thorough mastery of the great works of Greece and Rome. At the same time he applied himself to modern literature, both in belles-lettres and in abstract thought; history in particular he always devoured with avidity. In no very long time he showed a decided tendency towards the Political and Mental Sciences, which tendency was fostered by his choice of companions. In business he became acquainted with Ricardo, who directed his mind to Political Economy, and introduced him to the still more powerful ascendancy of James Mill. He has publicly acknowledged his great obligations to Mill; through him he became acquainted with Bentham, and contracted an intimacy with Mr. John Stuart Mill, which was sustained through life. James Mill was himself a competent Greek scholar, and an admirer of the

philosophy and the democratic institutions of Greece: Grote was affected with the like sentiments. They were further agreed in bringing the ancients into comparison with the best modern thinking.

In 1820 Mr. Grote married Miss Harriet Lewin (second daughter of Thomas Lewin, Esq., of the Hollies, Bexley, Kent), who, both in cooperation with him and by her separate works, will leave a mark behind her. The year succeeding his marriage saw his first publication, an anonymous pamphlet entitled "Statement of the Question of Parliamentary Reform: with a reply to the objections of the *Edinburgh Review*, No. 61." The article in the 'Review' was written by Sir James Mackintosh. The pamphlet is a clear and forcible argumentative statement of the Reform question, then beginning to be seriously canvassed. About 1824 he formed the purpose of writing a 'History of Greece,' his own inclinations being strengthened both by Mr. Mill and by Mrs. Grote. In the 'Westminster Review' for April 1826, he published an article of sixty pages on Grecian History, containing a minute criticism of the misrepresentations of Mitford. He afterwards acknowledged in the preface to his own History that the first idea of it was conceived "at a time when ancient Hellas was known to the English public chiefly through the pages of Mitford."

About this time a small Society was formed for readings in philosophical subjects, the meetings of which took place at Mr. Grote's house, in Threadneedle Street, on certain days, from half-past eight till ten in the morning, when the members had to repair to their respective occupations. The members were Grote, John Stuart Mill, Roebuck, William Ellis, William and Henry Prescott, Eyton Tooke, Charles Buller, two brothers Whitmore, and George John Graham (afterwards assignee in bankruptcy). The mentor of their studies was the elder Mill. The readings embraced the logical treatises of Hobbes, Du Trieu, and Whately; Hartley on Man; and, at a later period, Mill's 'Analysis of the Mind.' These works were read out paragraph by paragraph, commented upon by each member in turn, discussed and rediscussed, until no one had any thing further to say.

The logical discipline thus imparted to these youthful students has unquestionably told in various ways upon the mind and literature of this country and the world.

The death of his father in 1830 made him one of the two chief partners in the banking-house. Although strongly sympathizing with the Reform agitation which had then commenced, he had not as yet taken a public part in it. He now came into prominence in the City of London movement. In 1831 appeared his work entitled "Essentials of Parliamentary Reform," which was characterized by his thoroughness and vigour of thought and language. His "essentials" were as follows:—The first was an extension of the suffrage, to commence with enfranchising whoever gave evidence of possessing £100 a year, to be followed by further extensions according to the advancement of education. The second essential was the Ballot; the others were,—reduction in the number of the House (to about

300), equalizing of constituencies, improved polling arrangements, and greater frequency of election.

Placed at the top of the poll for the City of London, he took his seat in the Reformed Parliament in February 1833. His public career is most noted by his motions on the Ballot, made every year, with one exception, from 1833 to 1839. His handling of this question was exhaustive; the ablest advocates that succeeded him have confessed themselves unable to add either to the number of his arguments or to the cogency of his replies; while the intense respect for individual liberty of action which animated his whole life, gave to a political question a high ethical tone. But this was only one out of many topics that he brought forward during his nine years' work in Parliament. The Bank Charter, the Poor-Law Amendment Act, the Municipal Reform Act, the Corn Laws, the Irish Church, the Irish Coercion Bill, the Canadian Rebellion, the Civil List were among the great and stirring questions that called out his oratorical powers. He sounded the first note on Church Reform and on the removal of the Jewish Disabilities, and was always ready to chime in with every proposal for extending individual liberty, for improving education, as well as for contributing to the general well-being of the community. His last important speech was (in 1841) on the Syrian question, producing a very marked impression.

In 1841 he retired from Parliament, and in 1843 withdrew from active partnership in the banking-house, to devote himself to the composition of his 'History,' which he completed in twelve volumes in 1856. The first two volumes contained an independent examination of the Homeric poems, an original view of the Spartan institutions and legislation of Lycurgus, and, greatest of all, an entirely new handling of the early legends. The next two volumes detailed the rise of the Athenian Democracy, in which a distinction was carefully drawn between the institutions of Solon and the amendments of Cleisthenes. The fifth and sixth volumes traced the growth of the Athenian Empire, and the commencement of the great struggle known as the Peloponnesian War. The same subject occupied two more volumes, the seventh and eighth, which were concluded by the celebrated chapters on the Sophists and on Socrates. Some critics ventured the opinion that the work had attained its climax, that the author had exhausted his subject and himself, and could impart no new surprise. The opening of the ninth volume proved the rashness of the criticism; in nothing did Mr. Grote's peculiar powers show to better advantage than in recounting the advance and retreat of the Ten Thousand. He could now also point out to the haters of democracy what Greece had gained by the substitution of the Spartan headship for the Athenian; and very soon came the reverses and the prostration of that headship by the Thebans, under the leadership of Epaminondas. The extraordinary revolutions in Sicily—the career of the *Siculi tyranni*, and their overthrow by Timoleon—formed a splendid theme, and had ample justice done to it. The eleventh volume was occupied with the struggle against Philip of Macedon, in which the leading figure was

Demosthenes. The author had vindicated the Athenians and their democratic constitution from many unfair aspersions; he now exposed their real vices and degeneracy, their growing reluctance to personal military service and to the sacrifices of war. The last and crowning exploit of the historian was to unmask the world's conqueror and favourite, Alexander. With the most ample acknowledgments of Alexander's military genius and indefatigable activity, Mr. Grote has stripped his enterprizes and his conduct of every other virtue or merit; and in so doing has read a moral lesson against that adoration of force which has always lent a powerful aid to the oppressors of mankind.

It has been common to express a regret that the history was not continued down to the Roman conquest of Greece. The reason was characteristic of the author. In the preface to the first volume he announced it as his purpose to exhaust the *free life* of collective Hellas; and at the close of the twelfth, having to relate the honours bestowed upon Demochares, the nephew of Demosthenes, for acting on suppliant embassies to the foreign masters of Greece, he said that when such begging missions are the titles to honour of Athenian citizens, "the historian accustomed to the Grecian world as described by Herodotus, Thucydides, and Xenophon, feels that the life has departed from his subject, and, with sadness and humiliation, brings his narrative to a close."

There is no doubt that Mr. Grote was especially cast for an historian, although in his time he played many parts. He had an intense interest in human beings, and a strong passion for narrative; he had read the history of every country that had a history; while his memory for historical facts and dates was of the first order. In his study of science, and especially of the moral and political sciences, he was strongly arrested by the modes of arriving at scientific doctrines, and by the struggles of the mind in the pursuit. This more particularly qualified him to be the historian of philosophy.

The original scheme of the 'History of Greece' comprised a full account of Greek literature and Greek speculation. The chapters on Homer, on Lyric Poetry and the Seven Wise Men, on the Ionic Philosophers, on the Drama, Rhetoric, Dialectic, and the Sophists, and, finally, on Socrates were in fulfilment of the scheme. The remaining portion, including Plato and Aristotle, was postponed for a separate work. "Plato and the other Companions of Socrates," the first instalment, occupied nine years, and was published in 1865.

This great work brought into prominence characteristics of the author's mind that had been but little apparent in the 'History of Greece.' It comprises a full analysis of all the Platonic writings, with a rediscussion of the numerous questions (Logical, Ethical, Psychological, and Metaphysical) that are broached by Plato. He introduces a marked division between two classes of the Dialogues,—the one class Socratic, or Dialogues of Search, whose conclusion is usually negative; the other class Dialogues

of Exposition, wherein is announced some positive dogma. The great interest, in Mr. Grote's eyes, attaches to the first, the Dialogues of Search; never before were the peculiarities manifested by these put in such strong relief. They were the consummation of Grecian Dialectic, or free discussion and argumentation between opposing opinions, which had been begun by Zeno, and was practised by Socrates in his indiscriminate cross examination of the Athenian citizens; from Socrates it was adopted by Plato. "A string of objections never answered, and of difficulties without solution, may appear to many persons nugatory, as well as tiresome. To Plato they did not appear so. At the time when most of his dialogues were composed, he considered that the search after truth was at once the noblest occupation and the highest pleasure of life." This negative procedure involved with it the assertion of an unfettered judgment upon all questions whatsoever; in short, perfect toleration of differences of opinion. For this Socrates cheerfully suffered martyrdom. Plato also, in his negative days, made noble appeals on behalf of freedom of thought. From intense fellow-feeling with the same cause, Mr. Grote dwells emphatically upon this aspect of Plato. "The orthodox public do not recognize in any individual citizen a right to scrutinize their creed, and to reject it if not approved by his own rational judgment." "'Nomos' (Law and Custom), 'King of all,' exercises plenary power, spiritual as well as temporal, over individual minds, moulding both emotions and intellect according to the local type." To the protest by Socrates and Plato against this despotism in the ancient world, Grote, on every opportunity, adds an equally strenuous remonstrance against the like despotism in modern times.

From a very early period of life he had studied profoundly the influence of men's feelings or emotions in corrupting their sense of truth. Several of his most famous disquisitions have consisted in the illustration of this subject, more especially his handling of the Grecian Legends and his chapters on Socrates. As an historian of philosophy, he habitually traces the operation of this bias, which he held to be very far from extinct in the present day, although less often present in Physical science than in Ethical and Psychological doctrines.

At the age of 70 he commenced his work on Aristotle. Neither he nor any of his intimate friends could detect the slightest falling off in his intellectual vigour, yet he was painfully conscious of a diminution in his working pace; so that after six years he had executed but a fraction of his survey of the Aristotelian writings. What he has left amply maintains his reputation gained by the 'Plato.' He has exhaustively analyzed, in his peculiarly luminous style, the whole of the treatises comprised under the 'Organon,' being all the works that have been the fountains of the common scholastic logic—*Categories*, *De Interpretatione*, *Analytica priora* and *posteriora*, and *Sophistic Elenchi*; together with an elaborate account of the large treatise, the *Topica*, seldom adverted to, but valuable in his eyes, as exhibiting the methodized Dialectical debate of the Athenian schools.

He has also given an introductory sketch of the *Metaphysica*, together with a full abstract of the greater part of it. Of the physical treatises which he coupled with the *Metaphysica*, he has given an analysis of *De Cælo*. He had previously published a careful account of the peculiarly difficult and important treatise *De Anima*.

Mr. Grote was one of the original founders of the London University, afterwards called University College, and was an active member of Council from the commencement, in 1827, up to the year 1831. He entered with zeal into the scheme, as proposing to impart an education that should be at once extensive and unsectarian. He again joined the Council in 1849, and from that time till his death took a leading part in the administration of the College. In 1860 he became Treasurer; and on the death of Lord Brougham, in 1868, he was elected President. He has bequeathed to the College six thousand pounds, the interest of which is to be paid to the Professor of Philosophy of Mind and Logic for the time being, on the conditions that his teaching is satisfactory, and that he is not a minister of religion.

His was one of seven names added by the Crown, on the 19th of March, 1850, to the Senate of the University of London, the others being Lords Monteaule and Overstone, Sir James Graham, Thomas B. Macaulay, Sir George Cornewall Lewis, and Henry Hallam. From the date of his appointment he gave unremitting attention to the business of the Senate, entering into every question that arose, and taking a lead in the most critical decisions of the University during the twenty-one years of his connexion with it. The first subject of great importance that came up after Mr. Grote's appointment was the admission of the Graduates to a position in the government of the University. On the 26th of February, 1850, there was laid before the Senate a declaration and statement, signed by 361 Graduates, desiring that the Graduates might be admitted into the corporate body. This was the commencement of a protracted agitation and struggle, terminated, in 1858, by the issue of a new Charter, which conceded what had been so long fought for. Mr. Grote cordially supported the claims of the Graduates. His aid in this cause was warmly acknowledged in a resolution of the Annual Committee of Convocation passed shortly after his death.

On the 1st of February, 1854, a memorial was presented to the Senate, signed by eleven persons (including Sir Rowland Hill and his three brothers, and Mr. William Ellis), in favour of throwing open the degrees of the University to all classes, irrespective of the manner or place of their education. On the 5th of April was presented another petition to the same effect, more numerously signed. No notice appears to have been taken of these applications. On the 19th of November, 1856, the Senate admitted the London Working Men's College among the affiliated colleges of the University. Mr. Grote opposed this step, on the ground that so long as the University required attendance on classes, a line should

be drawn between those who could give up their whole time to study and those that spent their day in industrial avocations. He had been hitherto favourable to the combining of certified class instruction with examinations as requisites to the degrees. The admission of the Working Men's College (carried chiefly by members of Senate opposed to the restricting of the degrees to students in the affiliated colleges) shook his faith in the value of the class certificates. About the same time it became known to the Senate that certificates were granted by some of the affiliated colleges on mere nominal studentship. This completed the conviction in Mr. Grote's mind that the degrees should be thrown open, and granted on the exclusive test of examinations. Accordingly, when the subject came up in connexion with the Draft Charter, by which the Graduates were to be admitted, he supported the insertion of a clause for abrogating the original constitution as to affiliated colleges; which clause was carried in the Senate by a large majority. Many remonstrances followed this decision, especially from the affiliated colleges. The Senate entrusted to Mr. Grote and Mr. Warburton the drawing up a report on these remonstrances, which was presented to the Senate on the 22nd of July, 1857. This report was Mr. Grote's composition, and contains an exhaustive discussion of the arguments of the remonstrants.

On the 8th of July, 1857, while the Draft Charter was under discussion, a memorial was laid before the Senate, signed by twenty-four men of science, Fellows of the Royal Society, suggesting the institution of degrees and honours for proficiency in mathematical and physical science. On the 14th of April, 1858, the Senate appointed a Committee to consider the propriety of establishing degrees in science; of this Committee Mr. Grote was a member, along with the Chancellor, Mr. Warburton, Sir James Clark, Dr. Arnott, Mr. Faraday, Mr. Brande, Mr. Walker, and Mr. Hopkins. The Committee held a series of meetings, and examined the memorialists individually as to their views and wishes, and afterwards drew up a report in favour of the principle of degrees in science. Being re-appointed by the Senate to prepare a definite scheme, the Committee agreed that there should be a Bachelor's Degree, which should rest on a broad and comprehensive basis of scientific acquirement, and a Doctor's Degree for eminence in special branches. A draft-scheme for the several Degrees was, at the Committee's request, prepared by Dr. Arnott. It was very much owing to Mr. Grote's advocacy that the Moral Sciences were retained in the programme, several members of the Committee being disposed to limit the subjects of examination to the Physical and Natural-History Sciences. On the 7th of July, the Senate, with one dissentient voice, adopted the report. The degrees were instituted accordingly. The other universities are slowly entering upon a similar course.

On the 27th of February, 1862, he succeeded Sir John Lefevre as Vice-Chancellor.

It was a singular testimony to the largeness of his views, that Mr. Grote's

life-long classical studies and associations left him free to appreciate fully the great importance of science in education. In point of fact, however, he combined with his own erudite pursuits an intense avidity for the physical sciences, along with the metaphysical, and they formed a considerable portion of his reading to the last. He uniformly resisted all proposals to limit the study of logic and moral philosophy, or to lower its position in the degrees where it had obtained a place; and, generally, he was an advocate for the breadth of culture maintained in the Matriculation and Degree Examinations, as contrasted with the restricted number of subjects required for the Oxford and Cambridge degrees.

He bequeathed his library to the University.

On the death of Hallam, in 1859, Mr. Grote became a Trustee of the British Museum, and, as in the case of University College and the University of London, he gave unfailing attendance on the meetings of the Trustees, and sat on the most laborious Committees. In 1864 he was also elected a Trustee of the Hunterian Museum. His election to the Royal Society was in 1857.

He was pressed by Mr. Gladstone to accept a peerage, that he might take part in the business of the House of Lords; but he declined to enlarge the sphere of his active duties.

The disease that cut him off made its appearance last December. It did not obscure his faculties or impair his usual tone of spirits, and he received in his own house the Committees of the University of London, transacted business, and conversed with his friends till the last three weeks of his life. He died on the 18th of June, and on the 24th was interred in Westminster Abbey.

Mr. Grote's published writings, coupled with the barest outline of his life and work, reveal the lineaments of a great character, the intellectual and the moral ingredients supporting each other. In his public career, and in his wide literary research, a clear, powerful, and originating intellect was guided by the purest aims and the most scrupulous arts. With scholarly resources of language, his rhetoric is the servant of truth. At all points merging his own self-importance, he never passes by opposing considerations, and does justice to every rival. The reverse of sanguine as to human progress, he yet laboured for every good cause that satisfied his mind,—science, education, and the self-acting judgment of the individual. Differing in many points from the prevailing opinions of the time, he avoided giving needless offence, and cooperated with men of all shades of doctrine, political and religious. In the depths of his character there was a fund of sympathy, generosity, and self-denial rarely equalled among men; in the exterior, his courtesy, affability, and delicate consideration of the feelings of others were indelibly impressed upon every beholder; yet this amiability of demeanour was never used to mislead, and in no case relaxed his determination for what he thought right. Punctual and exact in his engagements, he inspired a degree of confidence and respect which acted most beneficially on

all the institutions and trusts that he took a share in administering; and his loss to them must be accounted a positive calamity.—A. B.

Dr. AUGUSTUS WALLER was the son of Mr. William Waller, of Elverton Farm, near Faversham in Kent, and was born on the 21st of December, 1816. The family left England to reside at Nice, where Mr. Waller died when his son was only fourteen years old. The son came to England, and lived for some time with Dr. Lacon Lambe, of Tewkesbury, but afterwards resided with and studied under Dr. William Lambe, who was a well-known vegetarian; and the youth was brought up to the age of eighteen on a purely vegetable diet, his father having been a strict disciple of Dr. Lambe.

Augustus Waller went through his course of medical study at Paris, and took his degree of M.D. in that University in 1840, when he was twenty-four years of age. In 1842 he entered upon general medical practice at Kensington, and two years later married Matilda, only daughter of John Walls, Esq., of North End, Fulham, who survives him.

But while steadily following his vocation as a medical man, his mind was irresistibly bent on scientific investigation, and what time he could spare from attendance on patients was employed in carrying on original researches in physiology and physiological anatomy. Accordingly during this period of his career he published several important contributions to those sciences, two of which obtained a place in the *Philosophical Transactions**; and he was elected a Fellow of the Royal Society in 1851.

Meanwhile his scientific pursuits came to engross more and more of his time and thought, and, after a few years, he resolved to give up his practice, which had already become considerable, and to devote himself to science as the main occupation of his life. In pursuance of this determination, and with a view to meet with more favourable opportunities of carrying on his scientific work, he left England in 1851 and took up his residence for some time at Bonn. The influence of his more favourable position soon became manifest. In association with Professor Budge, he engaged in experimental inquiries on the influence of the nervous system upon the motion of the iris, by which it was shown that the influence of the cervical portion of the sympathetic nerve in maintaining the dilatation of the pupil is derived from a particular region of the spinal cord; and fresh light was at the same time thrown on the constitution and central relations of that nerve. These researches were made known in three memoirs published in the '*Comptes Rendus*' for 1851 and 1852, in the joint names of the authors, and were honoured with the award of the Monthyon Prize of the Academy of Sciences for 1852. Dr. Waller subsequently carried on

* "On the Minute Structure of the Papillæ and Nerves of the Tongue of the Frog and Toad," *Phil. Trans.* 1849; and "Experiments on the Section of the Glossopharyngeal and Hypoglossal Nerves of the Frog, and observations on the alterations produced thereby in the Structure of their Primitive Fibres," *Phil. Trans.* 1850.

his experimental investigations independently, and had an important share in the discovery of the influence of the sympathetic nerve on the contractility of the blood-vessels of the head; and he first demonstrated, by positive experiment, the relation of the cilio-spinal region of the spinal cord to the nerves governing these vessels.

In the 'Comptes Rendus' for 1851 Dr. Waller gave an account of a New Anatomical Method of investigating the nervous system. When a nerve is cut across, the distal portion undergoes disorganization; its fibres become entirely altered in their microscopic characters, and may thus be distinguished from those of uninjured nerves. Dr. Waller took advantage of this effect of section as a means of tracing and discriminating the fibres of a given nerve when mixed with fibres of other nerves in their peripheral distribution. Moreover he showed that this method might be used to elucidate the functions of nerves; for the disorganization of nerve-fibres consequent on their section involves the loss of their functional properties, and accordingly, when a nerve contains fibres from two or more sources, its function may be analyzed, as it were, by the separate section and disorganization of its different tributaries, and the consequent elimination of the special operation of each from the general effect.

The introduction of this method must be regarded as one of the most valuable contributions of recent times to the advancement of our knowledge of the nervous system; and it was not only happily applied by himself in several neurological investigations, but it has been eagerly and successfully taken up by others, who gladly acknowledged its authorship, and have recognized it as the "Wallerian method." In the course of these researches Dr. Waller also discovered that the nervous ganglia exert a certain influence in maintaining the integrity of nerve-fibres which are connected with them. In recognition of his merit in devising and applying this new method of investigation, the French Academy of Sciences conferred on him the Monthyon Prize for the year 1856, and the President and Council of the Royal Society awarded him one of the Royal Medals for 1860.

From Bonn Dr. Waller went to Paris to continue his labours; but he there contracted a low form of fever with severe cerebral symptoms: this was in 1856; and he was so much prostrated by the effects of this illness, that he was for a long time quite incapacitated for work. He accordingly returned to England, and passed the succeeding two years in comparative repose; but, his health having improved, he accepted the appointment of Professor of Physiology in Queen's College, Birmingham, and the place of Physician to the Hospital, and again resumed his scientific investigations. These appointments, however, he did not long retain. Threatenings of the heart-affection which eventually proved fatal to him, induced him again to seek for quiet, and, after two years' longer stay in England, he retired to Bruges, and afterwards to the Pays de Vaud. With renewed promise of health and activity, he in 1868 took up his abode in Geneva with the purpose of practising there as a physician. In the cultivated scientific circles

of that city Dr. Waller found agreeable companionship. He was elected a Member, of the Société de Physique et d'Histoire Naturelle, and again applied himself with zeal to scientific work. Having been appointed to deliver the Croonian Lecture before the Royal Society in the spring of 1870, he made a short visit to London for that purpose. The subject was "On the Results of the Method introduced by the Author of investigating the Nervous System, more especially as applied to the elucidation of the Functions of the Pneumogastric and Sympathetic Nerves," and it appears to have been his last work. He had for several years been subject to attacks of angina pectoris, and the accession of a fit of more than usual severity caused his death on the 18th of September, 1870.

Whilst Dr. Waller's researches and discoveries concerning the nervous system constitute his most conspicuous claim to distinction as a man of science, he successfully took up other subjects of physiological inquiry. As especially worthy of note may be mentioned his observations on the escape of white blood-corpuscles from within the small vessels*. This remarkable fact had been already pointed out by Dr. William Addison, and its relation to the nutrition of tissue, as well as to secretion, inflammation, and suppuration, instructively discussed by him. Dr. Waller described the corpuscles as actually piercing the wall of the containing vessel, as if by some softening or solvent operation. The subject has again been brought forward by Dr. Cohnheim of Breslau, to whom his countrymen are for the most part in the habit of assigning the discovery.

Dr. Waller was endowed with a remarkable aptitude for original investigation. Quick to perceive new and promising lines of research, and happy in devising processes for following them out, he possessed consummate skill and address in experimental work. During his early studies in Paris he had paid much attention to physical science, and this stood him in good stead in his future investigations. By those who knew him personally, he was much esteemed for his moral qualities, as well as for his intellectual endowment. His sudden death, before he had completed his fifty-fourth year, whilst the cause of poignant grief to his relatives and friends, must also be accounted a serious loss to physiological science.

The Rev. WILLIAM VENABLES VERNON HARCOURT, M.A. OXON., was born in June 1789, close to the ancient home of his family at Sudbury, in the Rectory House, then occupied by his father, the Hon. and Rev. Edward Venables Vernon, who became Bishop of Carlisle, and afterwards Archbishop of York, and took the name of Harcourt on acceding to the property of the deceased Earl. Mr. Harcourt, the fourth son in a family of sixteen children, had the advantage of his father's instruction, and did not proceed to a public school.

His first destination was for the Navy, in which he served for five years; but then his literary tastes and predilection for the church prevailed, and

* Phil. Mag. 1846.

he entered Christ Church, Oxon., with the advantage of the personal friendship of Cyril Jackson, the Dean. At that time Conybeare and Peel were conspicuous members of his College, and the University was leading to eminence Buckland, Keble, and Whately. Dr. Kidd had been for some years an admirable teacher of Chemistry, and to this attractive subject (to which his attention had first been drawn by Dr. Isaac Milner, who was Dean of Carlisle when his father was Bishop of that diocese) Mr. Harcourt clung with affectionate fidelity through all his subsequent life.

Soon after leaving the University (in 1811) Mr. Harcourt began his duties as clergyman at Bishopthorpe, close to his father's residence, and speedily manifested the good effects of his Oxford career by associating himself with the movement then beginning in Yorkshire, in favour of institutions for the cultivation of science. He constructed a laboratory, and became greatly occupied in chemical analysis, not a little aided and encouraged in this pursuit by his early friends, Davy and Wollaston. The latter explained to him some of the methods of qualitative analysis on a small scale, in which he was unrivalled. The great ideas of the former he kept steadily in view. From Buckland and the brothers Conybeare he acquired a settled partiality for the then rapidly advancing science of Geology.

In 1821 the famous cavern of Kirkdale was opened in Yorkshire, and zealously explored by Buckland. Some of the treasures of this rich repository of prehistoric life-forms were divided among several explorers in Yorkshire, and three of these, viz. Mr. Atkinson, Mr. Salmond, and Mr. Thorpe, concurred in a resolution to reunite them in one collection, as a basis for a Yorkshire museum of natural history and antiquities. Of the institution which was established in consequence of this arrangement, the "Yorkshire Philosophical Society," Mr. Harcourt was chosen President, and by all the means at his disposal extended its influence, and animated and directed its energies.

The geology of Yorkshire had begun to attract attention; and one of the earliest engagements for public lectures was contracted in 1824 with Mr. Smith, the author of the first geological map of the county, as well as of the first map of the strata of England and Wales. In 1826 Mr. Phillips was appointed to be the keeper of the Yorkshire Museum, then contained in a small house; but from this time it grew so rapidly as to require the erection of a spacious building, with library, lecture-room, and laboratory, at a cost of £9000. During many years Mr. Harcourt and his younger friend just named might be often met engaged in geological explorations*. The laboratory, now removed to Wheldrake, was never unemployed†; the monthly meetings of the Society heard always from

* See "Geology of the district round Caves," in *Phil. Mag.* May 1826; and 'On a Deposit of Bones at Northcliff,' 1829.

† See papers on Phosphates of Lead, on Scarbroite, on Lapis Lazuli, on Cadmium in Zinc Ore, &c., in *Phil. Mag. & Ann.*

the President some useful notices of the progress of science, and efforts, by no means unsuccessful, were made to spread through Yorkshire a spirit of local inquiry, which is still active in that large natural district.

It was fortunate for the British Association that its constituent meeting was, by advice of Sir David Brewster, arranged at York, by the ready zeal of a Society so active and under such good auspices. At this meeting (in 1831) the general plan of proceeding, and the essential basis of the Association, were drawn up by Mr. Harcourt, and proposed on the part of the Society which he represented. Discussed and accepted by a body of 367 members, among whom Murchison was conspicuous, they have remained practically the same, though in many points improved by experience through forty years of work.

Over this increasing enterprise Mr. Harcourt, as General Secretary, watched with unceasing vigilance for several years, and found many occasions for the employment of his personal influence in furthering the advancement of science, both by consultation with its acknowledged leaders and by appeals to the members of the Government. Elected President of the Association at Birmingham in 1839, he took occasion to discuss very fully the history of the discovery of the composition of water, supporting the claim of Cavendish by original documents, which were published in the annual volume. Not less remarkable in this address was the resolute vindication of the claim of science to entire freedom of inquiry into the constitution of nature, and a high-minded rebuke of the narrow views which refused to accept geological and astronomical truths on account of a supposed conflict of these with particular passages in the Bible—passages of matchless grandeur and beauty, but not destined to teach or control the teaching of the principles of natural science. Breathing, as we do now, the freer air of advancing inquiry, there may be some danger of forgetting the obligations we owe to churchmen such as Harcourt and Conybeare, who boldly employed their great influence to resist the heavy pressure of well-meaning but ill-reasoning theologians, who sometimes appeared to forget that they were not endowed with “supernatural knowledge of the mysteries of nature.”

One of the subjects to which Mr. Harcourt directed his attention with success was the effect of heat on inorganic compounds. With a view to extensive experiments on the effects of high heats in a manageable form, he began the construction of a furnace for burning hydrogen gas under great pressure; and by the aid of Sir William Fairbairn and the late Mr. Bryan Donkin, this furnace was provided with pressure-gauges, and became a safe and manageable instrument. It was employed for many years in the processes of fusion required for the production of various kinds of glass for optical uses*. Following similar ideas, he assisted as a Member of a Committee of the British Association in the examination of furnace-slugs, on which the Report was presented by Dr. Percy†. As

* Reports of the British Association, 1844.

† *Ibid.* 1846.

early as in 1834 another train of researches on the same general subject was set on foot by Mr. Harcourt, when he made arrangements for trying the effects of long-continued heat on rocks and minerals. For this purpose the furnaces of Low Moor, in Yorkshire, were employed by placing under them a large and varied series of rocks and minerals, and artificial mixtures selected and weighed to represent various natural crystals interesting to geologists in connexion with metalliferous veins and metamorphic rocks. The furnaces being usually kept in action for several years, it was expected that the long-continued and moderate heat would be sufficient to fuse some metals, and probably cause new combinations of oxides, silicates, or sulphides.

These operations gave indeed such results; and though, contrary to expectation, the direct influence of high temperature was found to be too great, the conglutination of sand to quartzite, the formation of iron veins, the occurrence of cavities lined with a web-like silicate, and what was almost a chaos of changes and displacements, showed the power of the agencies employed. It is much to be desired that those curious experiments should be repeated with precautions which are suggested by those on record*.

Accustomed to the use of the gas-furnace, Mr. Harcourt turned it to experiments on transparent compounds of fusion, which might be made to have refractive indices beyond the ordinary ranges, combined with scales of dispersion more favourable to achromaticity. In this he was guided by the trials of Faraday to prepare glass for optical purposes. Many years since, the writer, who was often helpful in this way, ground one of the earliest of the Harcourt glasses into a lens, and found it indeed a highly refractive clear substance, but too much traversed by striæ to be of practical use.

When, some years since, Mr. Harcourt removed his residence to the family seat at Nuneham, near Oxford, he constructed furnaces of a different kind for the carrying on of these experiments, and followed them with the zeal, resolution, and patience which had always characterized his firm and well-regulated mind. At an age when most men cease from continuous literary and scientific work, he with failing sight, but perfect memory, was indefatigable in training an assistant and superintending his work; making many new combinations with substances untried before, and now selected for quality of fusion, resistance to atmospheric vicissitudes, range of refraction and specific action on different rays of the spectrum. Thus it was hoped finally to acquire glasses of definite and mutually compensative dispersions, so as to make perfectly achromatic combinations. After innumerable trials, and the production of glass of extremely various quality, Mr. Harcourt, continuing his inspection to the last, had the satisfaction of believing that, though he could not remain to witness it, a good result had been assured, and that Professor Stokes, to

* British Association Reports, 1860.

whom all the specimens were submitted for scrutiny, would be able to construct a lens of sufficient size to be fairly tried, and thus crown the long-continued labour with a permanent benefit to science.

It was hoped that a full account of these experiments might have been prepared by the author of them, for his strong mind felt little of the weight of eighty years and overruled the bodily infirmities of age. But it was a character of the man never to cease experimental or literary research till he was satisfied; resolute to contend with difficulties till all were overcome, and too truly a lover of knowledge, with faith in its progress, to be hasty in publishing views on account of their novelty, which might be made valuable by proofs of their truth. Prof. Stokes has already presented to the British Association a notice* of these researches, and to him we must now look for further records of a work to which he has cheerfully contributed a large amount of valuable aid.

The scientific pursuits of Mr. Harcourt were followed in the midst of great occupation as a clergyman, not only in charge of his parish, but open to perpetual demands for help in public institutions of an educational and charitable character. The York School for the Blind, founded in honour of Wilberforce, the Yorkshire Hospital, the Castle Howard Reformatory, experienced the benefit of his guidance; indeed hardly any great movement in Yorkshire in favour of useful learning and comprehensive Christianity was carried on without his help, often given when his own health required cessation from labour. At many public meetings for these objects his place was to preside—a duty for which his thoughtful words and dignified presence, and a certain natural union of gentleness and firmness, admirably qualified him.

Though never a person of robust health, Mr. Harcourt was not much troubled by positive illness till towards the close of his life, when he became confined to a home rich in books and monuments of art, surrounded by a cheerful family, to which the graceful hospitality which had become a habit of his life brought many additions from the large range of his personal friendships and the more limited circle of men devoted to literature and science resident in his own neighbouring University. He had been elected a Fellow of the Royal Society in 1824. His death occurred at Nuneham in April 1871.—J. P.

IN JOHN FREDERICK WILLIAM HERSCHEL British science has sustained a loss greater than any which it has suffered since the death of Newton, and one not likely to be soon replaced. Though none of his discoveries were as brilliant as Davy's decomposition of the alkalies, or Faraday's magneto-electric induction, yet they ranged over a wider field than either of these philosophers could explore, and many of them are of first-rate importance. And of even higher value was the influence of his teach-

* Read to the British Association Meeting in Edinburgh, August 1871.

ing and example in wakening the public to a perception of the power and beauty of science, and stimulating and guiding its pursuit.

He was born March 7, 1792, at Slough, a spot consecrated by the work of his illustrious father ; an only child, he grew up with nothing to weaken the effect of the glorious pursuits and magnificent objects with which he was familiar. He was educated at home, but most successfully. He was a good classical scholar, a poet, an accomplished draughtsman, an excellent musician ; he spoke fluently several foreign languages, and was well versed in their literature. In 1809 he entered St. John's College, Cambridge, through which he passed with the highest honours, graduating as Senior Wrangler above Peacock. In conjunction with Peacock and another distinguished man of the following year, Babbage, he took an active part in a controversy then raging at Cambridge. From reverence to the memory of Newton, from limited intercourse with the continent, and perhaps from national prejudice, British mathematicians had advanced scarcely a step beyond their great master ; and it was scarcely possible for them to do so while they retained the Fluxional notation.

If we compare the treatises of Fluxions which at the time in question were current in the University with the French or German text-books on the same branch of analysis, we must be thoroughly ashamed, and almost disposed to admit the contemptuous statement of an Edinburgh reviewer, that there were in Great Britain only four men who could read the '*Mécanique Céleste*,' and that three of them were Scotchmen*. In all such transitions, besides the effect of habit, the adherents of an old theory are often bound to it by personal feelings, as if the giving up their former convictions implied some intellectual inferiority ; and it may happen that the champions of the new one do not bear their triumph meekly. At Cambridge, however, the struggle was not long ; for Woodhouse, the originator of the movement, was powerfully seconded by Herschel and his friends even while undergraduates. From them came the memoirs of the Analytical Society, the translation of Lacroix's '*Differential and Integral Calculus*,' and the examples of the same calculus, which virtually decided the question. The treatise on the calculus of finite differences which this last volume contains, and which was the work of Herschel exclusively, is specially valuable. Henceforward he entered on a wider field of labour, where the limits of this notice do not permit us to follow him ; for of him it may be said, as in Goldsmith's epitaph, "*Scientiæ nullum non genus tetigit, nullum quod tetigit non ornavit.*" For sixty years he enriched the Royal and other Societies with memoirs, precious not merely for the truths which they reveal, but for their suggestive character and their lucid developments. Their number and quality might seem great enough to overtask the energy of most men, yet they were supplemented by several sepa-

* Probably he meant by the three, himself, Brougham, and Ivory ; of Ivory this was true, but the competence of the other two for such a feat is very questionable.

rate treatises of great importance*, and by a profusion of lectures, reviews, and other contributions to periodical literature†. Out of this wonderful collection a few specimens may be selected.

Of all his writings, that which has been most universally admired and whose influence has been most widely felt is the "Discourse on the Study of Natural Philosophy," which in 1830 appeared in 'Lardner's Cabinet Cyclopædia.' For power and elegance of language, for clearness of illustration, for sound and far-sighted judgment, this little book cannot be surpassed. Of course the progress of research enables us now to see further in some directions than he could then anticipate, and the principles enunciated in the first chapter have roused the ire of some of the philosophists of the day. They, however, are proof against the cavils of such rash speculators, for they are in perfect unison with the noblest aspirations and highest intuitions of human nature. Of his purely physical works the astronomical portion must hold the first place as a stupendous monument of unwearyed labour, guided and enlightened by high theoretic anticipations and consummate skill.

As his father's greatest triumphs were achieved in the regions of double stars and nebulae, it was natural that his thoughts should be turned in the same direction, and that he should be impelled to complete as far as possible what Sir William had left imperfect. As early as 1821 he is found associated with Sir James South in forming a Catalogue of Double Stars, which appeared in our 'Transactions' for 1824, and was honoured with our medal. This union of labour was soon interrupted. South moved his observatory to Passy in quest of a clearer atmosphere than that of Blackman Street. Herschel also went to the continent. His friend Babbage had been overwhelmed by a domestic calamity, and Herschel abandoned his own pursuits to aid time and change of scene in alleviating the affliction of his companion‡.

On his return to Slough he resumed the double stars, and by 1832 he had observed 5075 of these objects, a large portion of which were new to astronomers. Most of these were observed with the 20-feet Herschelian reflector; and only they who have experienced the difficulty of obtaining good measures of a double star even with a steady equatorial can rightly appreciate the merit of such work performed with an instrument mounted as this was (see the drawing of it in the frontispiece of the 'Cape Observations'). The results were published in six memoirs, the last of which

* Two of these are of great value,—that on sound in the 'Encyclopædia Metropolitana,' and that on telescopes in the 'Encyclopædia Britannica' (this contains a description of the polishing-apparatus of his father).

† He was often requested by the Council of the Royal Society to report on papers submitted to it for publication. Some of these Reports which the writer has seen are so full of valuable matter as to make him regret that the rules of the Society do not permit their publication.

‡ In their tour they were received with great kindness by Laplace, who was fully cognizant of what they had done at Cambridge, and referred to it with much pleasure.

did not appear till 1836, for the necessary reductions (in which he had no assistance except from his aunt, the celebrated Caroline Herschel) required much time and labour.

His catalogues differ from those of his father in one important particular: they give the place of an object by its right ascension and polar distance for 1830, so that it can be easily found by a graduated instrument; whilst Sir William gave only its distance and angle of position with respect to the nearest of Flamsteed's stars, both of them mere estimates—a plan which, besides its uncertainty, was necessarily tedious.

But along with this great work he was engaged with the revision of his father's catalogue of nebulae and the discovery of new ones; and here the boon which he conferred on astronomy was still greater, such, indeed, as none but himself could have bestowed, for his telescope far exceeded any then existing in illuminating power. His earliest publication on this subject was the fine monograph and drawing of the nebulae in Orion, dating from 1824; but this was nobly followed out by his great Catalogue of Nebulae, which appeared in our Transactions for 1833. It contains 2307 nebulae and clusters, of which more than 500 were discovered by himself. In this also the right ascension and polar distance of each object are given for 1830, and it is enriched with many admirable drawings of such as offer some striking peculiarity. As might be expected, some of these have been found to omit details which are shown by the instruments of greater power which have been since constructed; but their general accuracy is acknowledged by all conversant in this kind of observation; and their value is shown in more than one instance by enabling subsequent observers to detect changes in the nebulae*.

The memoir which accompanies this catalogue is of high interest, full of vivid description, of far-reaching views, and enlightened speculation. Having so thoroughly explored the northern sky, he might have rested well satisfied with his work; but he felt the importance of extending it to the southern hemisphere, and of leaving to posterity a complete survey of the heavens, which, as made by the same observer and with the same powerful telescope, would be a record to which future observers might refer with confidence. With this view, and by his unaided resources, he removed, in the beginning of 1834, his family and instruments to the Cape of Good Hope, where he remained for four years, observing with intense activity, and exerting on the leading spirits of that colony an enlightening influence, the effects of which are still felt there. The results which he obtained were given to the world, not in separate memoirs, but in one volume, published in 1847 by the munificent aid of the then Duke of Northumberland. It contains catalogues of 2102 double stars and 1707 nebulae, with elaborate drawings of many of the latter and minute surveys of the stars

* In comparing these drawings with the present appearance of the nebulae, the telescope used should be made equiluminous with the 20-foot; for this purpose in a Newtonian the aperture should =23·14, in an achromatic =16·86.

adjacent to them. Some idea of the labour thus expended may be gained by the fact that for the two "Magellanic Clouds" 1143 stars, nebulae, and clusters were carefully measured, and 1203 stars for the great nebula in Argo. Of the splendid monograph of this wonderful object which he has given it is impossible to speak too highly, especially as, notwithstanding some conflicting testimony, the comparison of it with recent observations gives reason to believe that this nebula has undergone surprising changes in the last thirty years. Independent of these precious catalogues the volume is like a perfect gem; besides the charm of its style, it is a rich treasury of varied knowledge. As an example may be named the section on the causes which injure the action of reflecting telescopes, the chapters on astrometry, on Halley's comet, and on the solar spots; they all bear the stamp of a Master's hand, and contain suggestions all striking, and of which some have since been applied with the best results to practice. His labours on nebulae were completed much later in life by a general catalogue of them containing 5079, which appeared in our 'Transactions' for 1864. This includes all contained in his former catalogues and all discovered by others up to that time. It contains the places for 1860, and their precessions for 1880; so that it will be easily available for observers to the end of the century, and will long be their Manual of Nebulae.

His contributions to optics rank next to his astronomical in importance and number; but we shall only mention two, which gave a great impulse to the progress among us of this branch of physics. The first is a remarkable memoir on the aberrations of compound lenses and object-glasses, which appeared in our 'Transactions' for 1821. Before it opticians (at least in this country) corrected the spherical aberration of their object-glasses by empirical rules, and its theory was given in rude and unsymmetrical forms. By a happy choice of symbols and an elegant analysis he presents the theory of aberration in all its generality, and in as simple a manner as the nature of the question admits. He gives examples of the application of his theory to the construction of aplanatic doublets, and then to that of object-glasses. In discussing this he considers the dispersive power as composed of several terms, of which the first only is taken into account by opticians, and the rest constitute the irrationality of the spectra. This defect cannot be removed in a double object-glass unless the dispersive powers of higher orders are proportional to the first; and he recommends that the attention of future inquirers should be directed to the discovery of such a medium (a result which there is reason to believe has at last been obtained by the combined investigation of the late W. Vernon Harcourt and Professor Stokes).

The condition which he assumes for correcting the spherical aberration is, that the compound shall be aplanatic for near as well as remote objects. He tabulates the results for the various crown and flint glasses then used in England with a completeness which leaves nothing to be desired. It may be feared, however (notwithstanding the popular explanation of his method

which he afterwards published in the sixth volume of the 'Edinburgh Philosophical Journal'), that this paper has had little influence on the practice of British workmen, who then and now are far behind the requirements of the age in the knowledge of geometry.

It is evident that when he wrote this memoir Herschel did not accept the wave-theory; but in 1830 appeared in the 'Encyclopædia Metropolitana' his Treatise on Light, where it is brilliantly developed. In this work, which is still read with admiration and profit, the first part is an excellent system of ordinary optics, in which is included the substance of the previous memoir: then he states the emission and wave-theories of Light, applies each of them to explain the laws of reflection and refraction and the phenomena of Newton's rings and diffraction fringes, states the objections to each, and shows the superiority of the latter as irresistible. He next describes with singular clearness the phenomena of Polarized Light (not a few of which were discovered by himself), and gives their theory; and completes the work with the absorption of light and the effect of mechanical force on the optical properties of transparent media.

In other departments of science it must suffice to notice his investigations of the hyposulphites, to which photography is so deeply indebted; his researches on photography, including some curious and beautiful processes, and of which it may be remarked that he very nearly anticipated Mr. Fox Talbot in the discovery of the paper process; and his invention of the Actinometer. Nor is to be forgotten that on several occasions he gave powerful aid to the establishment of those simultaneous magnetic surveys which, under the auspices of Sir Edward Sabine, have thrown such light on the study of terrestrial magnetism.

It remains to say a few words as to his personal character; for a man, however high and varied his knowledge of physics or geometry, is a very imperfect specimen of his race if he be deficient in those higher qualities which should regulate morals and the duties of life. Herschel could abide this test. He was deeply and unostentatiously religious; exemplary in all the social relations. If his devotion to his father might seem excessive, it should be remembered what a man that father was. Far above the petty jealousies which haunt meaner minds, he was always ready to do the fullest justice to the labours of others, regarding them as fellow-labourers in a great work, not as rivals; and when it was his lot to be engaged in controversy, which he avoided as much as possible, he never allowed it to hurry him into any thing unworthy of a Christian gentleman. A beautiful trait in his character was the interest he took in those who, as yet unknown, were beginning to climb the ascents of science, and the encouragement he was always ready to afford them. One instance of this which it was the writer's lot to witness struck him so much that he ventures to mention it here. At an early meeting of the British Association a rough-looking man brought forward a paper on the strength of iron; unaccustomed to such an audience, his presence of mind failed, and he sat down muttering

"I can't go on." He sat down next to Herschel, and another paper was proceeded with; but Herschel after a little began to whisper to him: at first, in his agony of confusion, he seemed not to hear; but Herschel persevered, asked what his views were, spoke well of them, and, as his countenance brightened, asked leave to look over his paper, and having done so, encouraged him to bring it forward next day. But for this wise kindness that man might have relapsed into obscurity; but, as it was, he became ultimately a Fellow of our Society, and one of the highest authorities in a very important branch of mechanical engineering.

Herschel married Miss Stewart in 1829, and had a large family, of whom two sons are well known to us—Professor Alexander by his study of Meteorites, and Captain John, attached to the Indian Survey, distinguished by spectroscopic observations of the sun and other heavenly bodies.

He was created a Baronet in 1838. In 1850 he, as Newton before him, was appointed Master of the Mint. That establishment was undergoing an important change, its emancipation from the old Corporation of Moneyers; and the whole of its reorganization devolved on him. He also introduced an important check, which, however, has been discontinued since his successor's death. The official assays were controlled by others, made by two unofficial chemists, those whom he employed being Graham and Allen Miller. This office his failing health obliged him to resign after five years.

He was a President of the British Association and of the Astronomical Society. In 1855 he was nominated one of the eight Foreign Associates of the French Academy of Sciences, and was a member of almost every Philosophical or Literary Society of Europe.

His mind continued as clear and active as ever to the very last. He died on the 11th of May, 1871, and he was buried in Westminster Abbey by the side of Newton.—T. R. R.

WILLIAM BAIRD, M.D., F.R.S., F.L.S., &c., was the youngest son of the Rev. James Baird, and was born at the Manse of Eccles, in Berwickshire, in 1803. He was educated at the High School of Edinburgh, and afterwards studied medicine and surgery in the University of that city, and in Dublin and Paris.

In the year 1823, Dr. Baird, having previously made a voyage to the West Indies and South America, entered the maritime service of the East-India Company as surgeon, and remained in that service until 1833. During this period he visited India and China five times, also other countries; and in all his voyages availed himself zealously of the opportunities for studying his favourite science of Natural History which his position presented to him. In 1829 Dr. Baird assisted in the foundation of the well-known Berwickshire Naturalists' Club (to the publications of which he was afterwards a frequent contributor). The admirable example afforded by that institution has led to the formation of similar Associations

in other parts of the United Kingdom, and has thus contributed greatly to advance the knowledge of the natural history of particular districts, as well as to spread a taste for this attractive science generally throughout the country.

On quitting the East-India Company's service, Dr. Baird practised his profession in London for some years, until, in 1841, he accepted an appointment in the Zoological Department of the British Museum, where he remained until his death, on the 27th of January, 1872.

Dr. Baird's qualifications as a zoologist were of a high order, and his published writings are numerous and valuable: they consist chiefly of scattered papers on various subjects in the 'Edinburgh Philosophical Journal,' 'Loudon's Magazine of Natural History,' and its successor 'The Annals and Magazine of Natural History,' in the 'Zoologist,' and the 'Proceedings of the Zoological Society.'

His most important work, however, is the 'Natural History of the British Entomostraca,' published by the Ray Society in 1850. It contains an excellent account of the structure, physiology, and habits of the minute Crustacea which swarm in such abundance in our fresh and salt waters, and is justly regarded as a work of great ability and research.

He was also the author of a popular 'Cyclopædia of the Natural Sciences,' published in 1858, and of a valuable paper "On Pearls and Pearl Fisheries," as well as one "On the Luminosity of the Sea."

During the latter years of his life his attention was principally given to the Entozoa, of the known species of which he had, as early as 1843, drawn up a catalogue, which was published by the Trustees of the British Museum. Numerous papers on the same subject were also contributed by him to the 'Proceedings of the Zoological Society' and the 'Transactions of the Linnean Society.'

Latterly he was engaged in preparing a new and general catalogue of the Entozoa, comprehending the information acquired up to the present time. With this object he had accumulated a vast amount of material, and, had he lived to bring his undertaking to a close, it would have doubtless supplied a most valuable contribution to science.

But it is not merely by his publications that his great attainments must be judged. His knowledge of the various branches of Natural History was extensive and accurate, and his readiness in imparting it to others will long be remembered by those who were in the habit of studying in the British Museum.

As a man of science he was highly regarded by scientific men, and he was greatly esteemed for his genial and kindly nature by all who knew him. In private life especially he was much beloved, on account of the unvarying amiability of his disposition and the kindness of his manners.

Dr. Baird was a Fellow of the Linnean Society, and Member of the Imperial and Royal Botanical Society of Vienna. He was elected into the Royal Society in 1867.

WILHELM KARL RITTER v. HAIDINGER was the fourth and youngest son of Bergrath Karl Haidinger, one of the earliest cultivators of Mineralogy and Geology in the Austrian Empire, Professor of Mathematics and Mechanics in the Mining Academy of Schemnitz, who afterwards held an office in the Mint and Mining Department in Vienna, and was the author of:—*Dispositio Rerum naturalium Musæi Cæsarei Vindobonensis*; on certain rare fossils; on the minerals of the Wieliczka Salt-mines; on v. Born's method of amalgamation; sketch of a systematic classification of rocks; and on the minerals sapphire, ruby, and spinelle.

W. K. Haidinger was born in Vienna on the 5th of February, 1795, and was educated in the Academic Gymnasium of that city. In the autumn of 1812 he went to Gratz in order to profit by the teaching of Mohs, who in that year gave his first course of lectures on Mineralogy at the Johanneum; and about the end of the year 1817 followed him to Freiberg, sharing in his mineralogical researches, and making many new observations on the characters of several mineral species, which were never published separately in his own name. In May 1822 he accompanied Count August Breunner in a journey, undertaken in the interests of science, to France and England. In the autumn of 1823 he went to live in the house of Mr. Thomas Allan, Banker in Edinburgh, who was the possessor of a fine collection of minerals; and from the summer of 1825 till the autumn of 1826 he travelled with Mr. Allan's son Robert through Norway, Sweden, Denmark, Germany, North Italy, and France. In 1825 he published an English translation of the Treatise on Mineralogy by Mohs, with many additions and improvements. During the years 1822–1827 he contributed to the Transactions of the Royal Society of Edinburgh, the Memoirs of the Wernerian Society, and Brewster's and Jameson's Journals no less than forty papers on the geometrical and physical characters of minerals, including several newly discovered and described for the first time by himself. In 1827 he joined his brothers Eugen and Rudolph in the management of a flourishing porcelain manufactory which they had established at Elbogen in Bohemia in 1815; his eldest brother, Moritz, a lieutenant in the Austrian army, had died in 1809 of wounds received at Landshut. For thirteen years he took an active part in conducting the business of the porcelain works, but not without maintaining an uninterrupted connexion with Natural Science by making many communications to the Bohemian Academy of Science, Poggendorff's '*Annalen*,' the '*Zeitschrift für Physik*,' edited by Baumgartner and v. Ettingshausen, and a periodical bearing the same name edited by v. Holger; and in 1829 he published a work entitled "*Anfangsgründe der Mineralogie*."

In April 1840 he was appointed to succeed Mohs (who died at Agordo in the Venetian Alps on the 29th of the preceding September) as lecturer on Mineralogy and Custodian of a newly formed collection of Minerals, mainly the gift of Count Breunner, deposited in the Austrian Mint at

Vienna, known then as the collection of the "k. k. Hofkammer in Münz und Bergwesen," and later as the "Montanistische Museum." Having completed the arrangement of the collection and published a comprehensive catalogue of it, he began his first course of lectures on the 9th of February, 1843. He gave seven courses, the last being in 1849. During this period he made it one of his chief objects to encourage the members of his class, consisting chiefly of mining students, to undertake original investigations. In the year 1843 he ascertained the existence of trichoismin andalusite from Minas Geraes and in diaspora from Schemnitz, and constructed his "Dichroscopische Loupe" for exhibiting the contrast of colours between the two fields of oppositely polarized light when certain coloured crystals are viewed through it. On the 1st of April 1844 he discovered the remarkable phenomenon of the "Polarisationsbüschel," or Haidinger's Brushes as it is more commonly named. In 1845 he published his 'Handbuch der bestimmenden Mineralogie,' and a Report upon the results of mineralogical research during the year 1843. In November 1845 the Society of Freunde der Naturwissenschaften was formed, with Haidinger as its President and editor of their publications, consisting of 'Naturwissenschaftliche Abhandlungen,' in four volumes, 4to, and 'Berichte über die Mittheilungen von Freunden der Naturwissenschaften in Wien,' in seven volumes, 8vo. On the 14th of May, 1847, Haidinger was appointed one of the forty Members of the newly founded Imperial Academy of Sciences of Vienna. A Geological Map of the Austrian Empire, prepared, under Haidinger's immediate superintendence, by the most distinguished Members of the Montanistische Museum, and revised by Franz Ritter v. Hauer, was published in the same year. The Montanistische Museum and its Collections became the nucleus of the "k. k. Geologische Reichsanstalt," an institution founded on the 15th of November, 1849, with Haidinger for its Director, and a staff of local Directors and assistant Geologists. Its province was to collect materials for elucidating the geological knowledge of the whole Austrian Empire. This institution gave a powerful impetus to the culture of the natural sciences throughout the Austrian Empire. During the seventeen years that Haidinger presided over it, he strove with painful accuracy to acknowledge the services of every one of its Members who laboured under his direction. Through Haidinger's exertions the Geographical Society of Vienna was established in December 1855, and he became its first President. To his influence also may be traced the origin of the "Werner Verein" for the geological examination of Moravia and Silesia, the "Geologische Verein" for Hungary, and the "Società Geologica" of Milan, afterwards enlarged into the "Società Italiana di Scienze Naturali."

After a long and severe illness he retired on a pension from the office of Director of the Geologische Reichsanstalt on the 7th of October, 1866, and was succeeded by his former pupil Franz Ritter v. Hauer. Though enfeebled by illness and frequently unable to quit his room, he

preserved to the day of his death a wonderful elasticity of mind, which not only enabled him to take a lively interest in every new discovery made by others, but to continue his own scientific labours. He died, after a short illness, on the 19th of March, 1871, at Dornbach near Vienna, and was buried in the cemetery of that place on the 22nd.

He was the author of at least three hundred and twenty papers on the characters of many new minerals, mineralogical optics, pleochroism, pseudomorphs, geology, meteorology, and on the freezing and breaking up of the ice of rivers. During the years 1859–1870 he wrote a number of remarkable memoirs on meteors and meteorites. These are for the most part to be found, in addition to the Journals and Transactions already mentioned, in the ‘Naturwissenschaftlichen Abhandlungen,’ ‘Berichte über die Mittheilungen von Freunden der Naturwissenschaften in Wien,’ the ‘Denkschriften’ and ‘Sitzungsberichte der k. Akademie der Wissenschaften:’ one was published in the ‘Proceedings of the Royal Society’ for December 1868; it is entitled “On the Phenomena of Light, Heat, and Sound accompanying the Fall of Meteorites.” The last scientific papers he wrote, on the Meteorite of Meno, and on laboratory crystals of pyrite obtained by Professor Wöhler of Göttingen, were published in the ‘Realschule,’ a Journal edited by his son-in-law, Dr. Eduard Döll. He was Member, or Correspondent, of upwards of a hundred learned Societies, Knight of various Orders, including the Austrian Order of Franz Joseph and the Prussian of Pour le Mérite. He was elected a Foreign Member of the Royal Society in 1856. On the 29th of April, 1856, a Gold Medal, subscribed for by numerous friends, in recognition of his merits as the founder of a new scientific era for Austria, was presented to him. On the 5th of February, 1865, the seventieth anniversary of his birthday, his bust in marble, the cost of which was defrayed by the subscriptions of residents in almost every country in Europe and in many of the most distant colonies, was installed in one of the rooms of the Geologische Reichsanstalt.

HEINRICH GUSTAV-MAGNUS, elected Foreign Member of the Royal Society in 1863, was born on the 2nd of May, 1802, in Berlin, where his father, Johann Matthias Magnus, had founded a large mercantile establishment. At an early age he exhibited great aptitude for the study of Mathematics and the Natural Sciences, and was fortunately sent to a school in which particular care was bestowed upon instruction in the subjects which chiefly interested him. The easy circumstances of his family having enabled him to select the career that best suited his tastes and capacity, he determined to devote all his powers to the cultivation of Chemistry, Physics, and Technology. He entered the University of Berlin in 1822. Under no obligation to hurry through his Academic studies, he employed the following five years in attending lectures on Chemistry, Physics, and Mathematics. He also worked diligently in the University Laboratory, and

occupied his vacations in making mineralogical and technological excursions. He had resolved to qualify himself as a teacher of Technology, but was unwilling to undertake any definite duties without first seeking to complete his education by studying in other Universities. Accordingly in 1828 he went to Stockholm, where he worked under Berzelius, and had the good fortune to lay the foundation of a warm and life-long friendship with his master; and he visited Paris in 1829 and attended the lectures of Gay-Lussac, Thénard, and other eminent chemists and physicists. In 1831 he obtained his habilitation as a teacher of Technology and Physics in the University of Berlin, and laboured as a teacher with unexampled success for nearly forty years. He devoted the utmost care to the arrangement of his lectures, and spared neither trouble nor expense in procuring diagrams, models, instruments, and other requisites for their illustration. In 1834 he became Extraordinary Professor in the University. In the same year he passed several weeks in Paris for the purpose of inspecting various manufactories, especially those of chemical products. In the following year he came to England and visited various manufacturing establishments in Worcester, Birmingham, Manchester, and Liverpool. On the 27th of January, 1840, he was elected a Member of the Berlin Academy. In the earlier part of his career he lectured on Chemistry at the Gewerbeschule during the absence of Professor Wöhler; from 1832 to 1840 he lectured on Physics at the Artillery and Engineer Academy; and from 1850 to 1856 on Chemical Technology at the Gewerbeinstitut. In 1845 he became Ordinary Professor. In 1861 he was elected "Rector magnificus" of the University. His services to the Academy were not limited to the publication of original researches in the 'Monatsberichte' and 'Abhandlungen;' he devoted much time and labour to its financial affairs. He gave the first impulse to the establishment of the Humboldt foundation for aiding scientific travellers. He was a Member of the Section of Physics and Chemistry of the Prussian Society of Arts, and one of the twelve Naturforschende Freunde, and for many years took his share in the scientific labours of that Society. He was a Member of the Jury in the London and Paris Exhibitions of 1851, 1855, 1862, 1867. In 1865 he represented Prussia in the Conference on weights and measures, which held its session in Frankfort. The deliberations of this Conference finally led to the adoption of the Metric System throughout Germany.

In the autumn of 1869 he visited England, attended the Meeting of the British Association at Exeter, and then passed some weeks in the Isle of Wight; but travelling and change of air no longer produced their accustomed restorative effects. After returning to Berlin his labours were often interrupted by serious indisposition. For months his vigorous constitution struggled against the encroaching sickness. With a sense of duty that overcame the most violent pain, he continued to lecture on Physics, though with many interruptions. On the 25th of February he lectured for the last time. During the month of March he was seldom able to leave his

bed, but his intellect remained unclouded. He regarded his approaching end with composure, and died on the 4th of April, 1870. He was buried on the 8th in the Dorotheenstadt Cemetery.

The researches of Magnus, on a large number of widely different subjects, extend over a space of not less than forty-five years. Almost all of them appeared in Poggendorff's 'Annalen,' and the most part also in the publications of the Berlin Academy of Sciences. His first memoir, published in 1825, while yet a student, was on the reduction of the oxides of cobalt, nickel, and iron by hydrogen, and on the spontaneous inflammability of these metals in a state of fine division. In 1827 he published researches on the solubility of sulphur and selenium, without oxidation, in sulphuric acid. Between 1827 and 1833 he investigated the combination of platinous chloride with the elements of ammonia, the composition of sikrosmine, brochantite, vesuvian, the diminution of density of vesuvian after fusion, and discovered sulphovinic, æthionnic, and isæthionnic acids and their salts, and, conjointly with Amermüller, periodic acid. He experimented on the gases contained in blood, the exhaustion of soils, and on the nutrition of plants. He also invented a maximum thermometer, and employed it to find the temperature of an artesian well at Rüdersdorf, and afterwards, in an improved form, to find the temperature of a similar well at Pitzpuhl. He undertook researches on the boiling of mixed fluids, and the temperature of the vapour of saline solutions. Between 1841 and 1844 he carried out a most important series of experiments on the expansion of atmospheric air, hydrogen, and other gases, and on the pressure of the vapour of water at temperatures between 6° C. and 104° C. Without being aware that Magnus was engaged in these researches, Regnault was occupied with the same investigation; and the results obtained by these two experimenters were published almost simultaneously. Their close agreement affords a striking proof of the care with which they observed and the excellence of their methods, and affords a guarantee of the accuracy of the determination of the expansion of air and the pressure of the vapour of water, data of the utmost importance in physical and chemical investigations. He made observations on electromagnetic phenomena and thermoelectric currents, on the forms of streams of spouting fluids, the deviation of rifled balls from a vertical plane, the condensation of gases on the surfaces of solids. His later researches were mainly on the transmission of heat through gases and vapours, the differences of the nature of the heat radiated from smooth and rough surfaces, and the polarization of heat. His last communication to the Academy of Sciences was made on the 11th of October, 1869.

He was Corresponding Member of the French Institute, and actual or Corresponding Member of many other Academies and learned Societies.

The preceding outline of the life and labours of Magnus is extracted from a Biography by Professor Hofmann read before the Chemical Society of Berlin.

Sir RODERICK IMPEY MURCHISON, BART., K.C.B., &c.—Among the recent losses sustained by the Society we must place in the foremost rank that caused by the death of Sir Roderick Impey Murchison. It would not be easy to define precisely the place which he held among us. Without claiming to stand on the highest platform of scientific intellect, a patient gatherer of facts rather than a brilliant generalizer from them, he yet gained by common consent the position of a leader in the commonwealth of science, under whom men of all ranks, even though of higher ability and greater attainments than his own, were willing to serve. It was not merely his achievements in geology which gave him that pre-eminence; he owed nothing to success in other branches of science, for he seldom travelled beyond what he knew to be his proper domain, nor to grace of literary style. He wrote only on geological and geographical subjects, and that too in a plain matter-of-fact way not likely to attract readers for whom the subject-matter had not previously possessed an interest. His influence sprang from his personal character—noble-heartedness, indomitable energy, great tact and courtesy, and an influential social position, which enabled him to befriend science and scientific men, and to gain for them increasing consideration in society.

Descended from a line of ancestors who had attached themselves to the fortunes of the Earls of Seaforth, Murchison was born on February 19th, 1792, at the little estate of Tarradale, in Eastern Ross-shire, purchased by his father, who earned a small fortune as a medical practitioner in India. While still a child he was removed into Dorsetshire, and spent nearly the whole of his boyhood in England. He received his general education at Durham Grammar School, and being destined for a military career, was sent to the Military College of Great Marlow for the requisite professional training. When only fifteen years of age he obtained a commission in the 36th regiment of foot, and sailed for the Peninsula under Sir Arthur Wellesley. He went through the brief campaign which terminated with the Convention of Cintra, and carried the colours of his regiment at Vimiera. In the succeeding campaign under Sir John Moore, which began at Lisbon and ended at Corunna, he underwent great hardship, and was one of the footsore stragglers who narrowly escaped capture by the French towards the end of that retreat.

After the army returned to England, Murchison again went abroad on military duty, but being with the troops in Sicily, saw no more active warfare. At the peace of 1815 he quitted the army, and married the daughter of General Hugonin.

For the next ten years of his life he spent his time chiefly in England. He was much attached to field-sports, and used to speak of this as the fox-hunting period of his career. Yet under the influence of his amiable and intelligent wife he made some long journeys through the continent, specially devoting himself to the study of art in public and private collections, and making copious notes on this subject.

Partly induced by the natural-history tastes of his wife, and partly urged by the recommendation of Sir Humphry Davy (who, meeting him at the house of Mr. Morritt, of Rokeby, and being struck with his active habits of mind and body, pointed out to him the rising science of geology as a fitting field for his exertions), Murchison turned his mind in that direction, and began to attend lectures on different branches of science, particularly those delivered at the Royal Institution.

Science was thus taken up by him not as an original pursuit, but after his powers of observation were matured, and when they had been further quickened by an active life at home and abroad. Being thus in a manner self-taught, and having thrown himself with all the energy of his nature into the study of geology, he was happily left to acquire his knowledge direct from nature, with but little bias from the controversies then so keenly carried on between the followers of Hutton and Werner. His devotion to the new sphere of activity which he had now chosen was not long in bearing fruit. In 1825, when thirty-three years of age, he published his earliest paper, "A Geological Sketch of the North-western extremity of Sussex and the adjoining parts of Hants and Surrey." Subsequently he explored parts of his native Highlands with Professor Sedgwick, and travelled through the volcanic district of central France with Sir Charles Lyell. From these early researches he was gradually led into that special field which he made his own, and from which his most important contributions to science were reaped.

His rambles through different parts of England had shown him how admirably the order of succession among the Secondary rocks had been worked out there by William Smith. But there was one great group of English rocks to which the Wernerian term "Transition" had been applied, yet of which the true stratigraphical relations had still to be traced. Murchison resolved to devote himself to the study of these rocks, in the hope of being able to reduce them into something like the same intelligible order which had been introduced among the later formations. The district chosen by him as the scene of his labours was that border land between England and Wales once the abode of the old British Silures. From time to time brief notices of his progress were communicated to the Geological Society, and at last, after five years of patient and enthusiastic labour, he produced his 'Silurian System.' This work undoubtedly forms a landmark in the history of geology. Dealing with rocks which had previously been but imperfectly known, he showed them to be capable of subdivision, and that when grouped in their true order they were found to embody some of the earliest chapters of the history of life upon the earth. His classification was based on the local characters of the rocks with which he was dealing; but that he had proceeded on broad and sound principles is shown by the way in which this classification has been adopted in all parts of the world.

This work laid the foundation of its writer's fame. In his subsequently

published 'Siluria,' which has gone through several editions, he recast the original work, introducing much detail regarding the extension of Silurian and older Palæozoic rocks into other countries; but while, in the later publication, the results given were necessarily often the work of other observers, the 'Silurian System' remains a monument of the independent labour of a mind quick in observation, sagacious in inference, patient in the accumulation of data, and full of that instinctive appreciation of the value of facts not yet fully understood which is near akin to genius.

Upwards of a hundred memoirs in the Transactions of Societies, chiefly on British and Continental Geology, addresses without number to Societies and Associations, besides more than twenty memoirs written in conjunction with other authors, remain as a monument of his industry. But to this mass of work must be added what he published in separate volumes—the 'Silurian System,' with its successor 'Siluria,' and his splendid volumes on 'Russia and the Ural Mountains.'

From the time when he began to devote himself to geology, Murchison continued to be one of the most active men of science of his day. Living chiefly in London, and coming daily in contact with men of every science, he took a prominent part in the work of more than one learned Society. In summer or autumn he usually made a tour for geological research, either in this country or on the continent, and continued this habit up to within two years of his death. In his Russian exploration he was absent from England for two or three years.

Of the honours heaped upon him from all parts of the world it is not necessary to speak. There was hardly an Academy anywhere which had not enrolled him among its Associates. He was elected a Fellow of the Royal Society in 1826, and in 1849 the Copley Medal was awarded to him for his three great works, 'On the Silurian System,' 'On the Geology of Russia,' and 'On the Structure of the Alps.' In 1855 he succeeded Sir Henry de la Beche as Director-General of the Geological Survey of Great Britain, an office which he held to the time of his death. On his return from Russia he had received the honour of knighthood, and at a later period he was nominated a K.C.B. and raised to the dignity of a baronet.

Sir Roderick Murchison was distinctly and specially a geologist. The attachment which his early Silurian labours had given him to Palæozoic rocks never waned; and though led now and then to make and record observations on later formations, he seemed always to return to the older deposits as his natural domain. He was not a palæontologist, yet no geologist could use more skilfully than he the data furnished by palæontology. This faculty he acquired in the Silurian region, and it continued to mark his work in the field both at home and abroad: it enabled him to apply to distant countries the principles which he had so successfully used in his own. Perhaps the leading idea of his scientific life should be regarded as a desire to establish the order of succession among rocks. It was this

desire which he so successfully realized in the Silurian region ; and it seemed to be always present with him in every district to which by choice or accident he might be led. He had a singularly quick eye for the geological structure of a country, seizing often with striking accuracy, from what to others seemed but slender evidence, the leading features of the grouping of the rocks.

No notice of his life and labours would be in any measure adequate if it did not allude to the prominence with which during the last few years of his life Sir Roderick's name was brought forward by the chivalrous devotion with which he maintained the belief in the safety of Dr. Livingstone. Yet this was only one of innumerable examples of his tenacious friendship and active benevolence. As President of the Geographical Society (a Society which is in a sense his own creation) he had many opportunities of befriending not only the cause of geography but the personal interests of travellers ; and it gave him a genuine pleasure to make use of these opportunities. It will be long ere the recollection will pass away of his stately courtesy of manner, suiting well that military bearing which dated from the old school of Wellesley and Moore, or of the kindness which made him shrink from allowing even ingratitude to alienate his friendship.—A. G.

Colonel WILLIAM HENRY SYKES was born in 1790. His father was Samuel Sykes, Esq., descended from an old Yorkshire family, of which he was the representative. At an early age Colonel Sykes entered the military service of the East-India Company, and as a young officer of the Bombay Army bore his part in the active military operations carried on in India in the early years of the present century. He was present at the memorable siege of Bhurtpore under Lord Lake. He served in the Deccan from 1817 to 1820, and was in command of a regiment at the battles of Kirkee and Poona, and took part in the capture of the Hill Forts. Throughout his active military career he enjoyed the confidence of the distinguished commanders under whom he served, as well as the esteem and regard of his brother officers. In 1824 he was appointed Statistical Reporter to the Government of Bombay, and finally quitted India in 1831. In 1833 he was promoted to the rank of Colonel ; but having returned to England he thenceforward applied himself to the pursuits of civil life. The knowledge he had acquired of Indian affairs, and the reliance placed on his intelligence and integrity, led to his being twice elected on the Board of Directors of the East-India Company ; and when the vast dominion they had so long administered was about to pass under the immediate government of the Crown, the Company gave a further proof of their confidence in Colonel Sykes by appointing him their Chairman at that important epoch. Meanwhile he was (1824) elected Lord Rector of the Marischall College of Aberdeen, and three years afterwards was chosen to represent that city in Parliament, and enjoyed the entire confidence of his constituents to the end of his life. As a Member of the Legislature he was an advocate

of economy, peace, and social progress, and in the divisions of the House of Commons, from which he was not often absent, his name was almost invariably to be found on the extreme liberal side.

During his life in India, as well as afterwards at home, Colonel Sykes was a zealous scientific observer. His favourite pursuits were zoology, meteorology, and fossil geology; and numerous contributions by him on these subjects, especially the first, are to be found in the Proceedings of the Zoological, Asiatic, and Geological Societies, and in the Reports of the British Association, of which he was one of the most active members, both in the Sectional Meetings and in the deliberations of the Council. One of his most considerable papers on Indian Meteorology was published in the Philosophical Transactions for 1850. Another subject which largely engaged his attention, both in India and at home, was Statistics. He was one of the founders of the Statistical Society of London, and continued to take a lively interest in its work; in 1863 he was elected President. He was also President of the Royal Asiatic Society, and Chairman of the Society of Arts. He became a Fellow of the Royal Society in 1834, and was more than once elected on the Council. Colonel Sykes married, in 1824, Elizabeth, youngest daughter of William Hay, Esq., of Renistoun; he died at his residence in London on the 16th of June, 1872.